

ABSTRACT

A multi-terminal logic device. The device includes a phase change material having crystalline and amorphous states in electrical communication with three or more electrical terminals. The phase change material is able to undergo reversible transformations between amorphous and crystalline states in response to applied electrical energy where the amorphous and crystalline states show measurably distinct electrical resistances. Electrical energy in the form of current or voltage pulses applied between a pair of terminals influences the structural state and measured electrical resistance between the terminals. In the instant devices, independent input signals are provided between different pairs of terminals and the output is measured as the resistance between yet another pair of terminals. Logic functionality is achieved through relationships between the applied input signals and the measured output resistance where the relationship is governed by the effect of the input signals on the structural state and electrical resistance of the phase change material. Logic values may be associated with the crystalline and amorphous states of the phase change material or the measured resistance between a pair of terminals.